DE LORENZO

DL NGL
NEXT GENERATION LABS

Laboratory for the digital professions of the future

DL NGL LAB

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INTRODUCTION

According to the European Commission, "basic digital skills for all citizens and the opportunity to acquire new specialized digital skills for the workforce are a prerequisite for actively participating in the Digital Decade."
Therefore, the Commission sets a target for 2030 to reach 20 million specialists employed in the EU in the field of information and communication technologies.

Based on these needs, De Lorenzo has developed a didactic laboratory for high schools and universities with the aim of:

- Bringing training closer to the new skills required by the job market.
- Training teachers and innovating exit profiles.
- Providing specific digital skills, with an effective simulation of places, tools and processes related to new professions.
- Building alliances with companies, startups, universities. and research centres.
- Enabling students to access quality and rewarding career paths.
- Expanding the training offer, with advanced digital equipment.

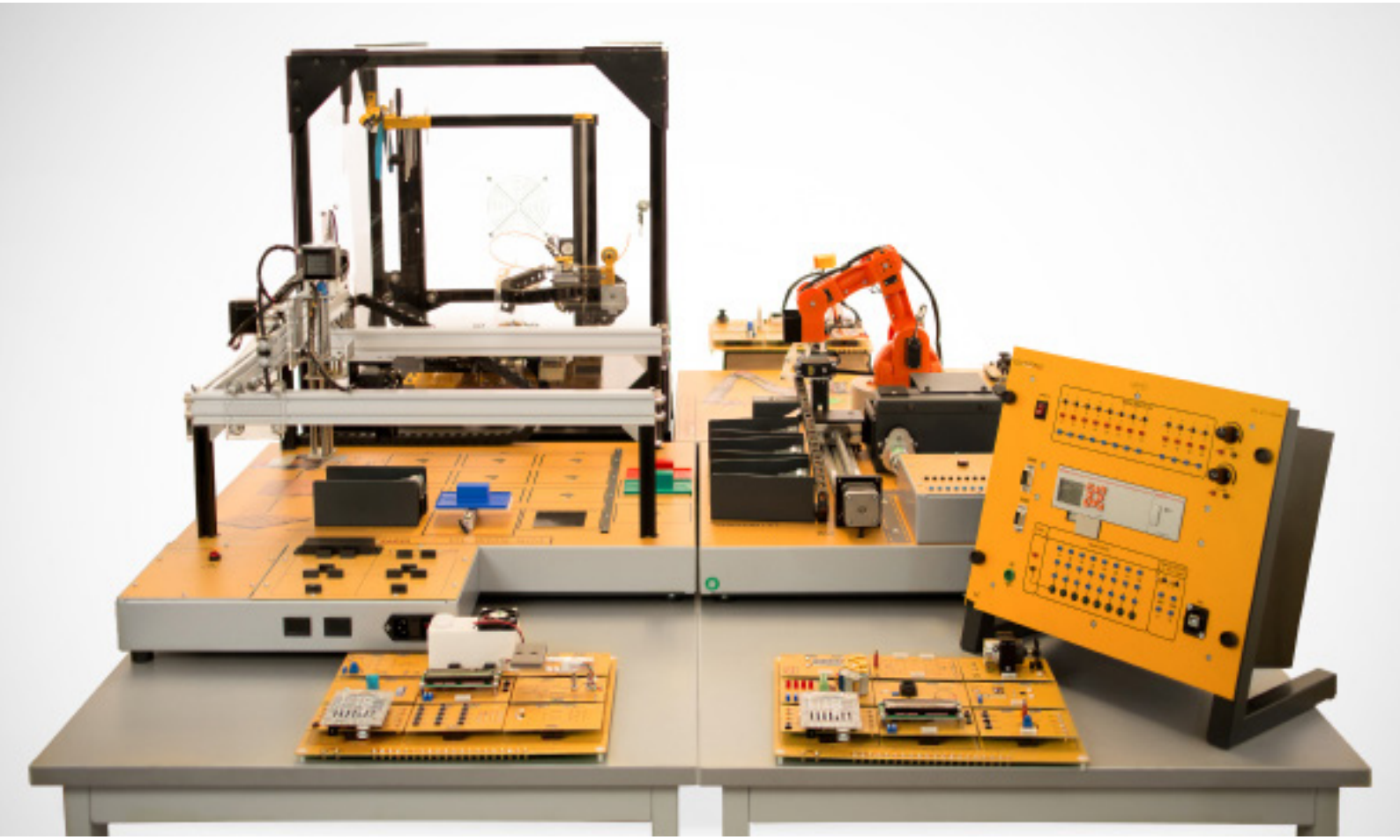
APPLICATIONS

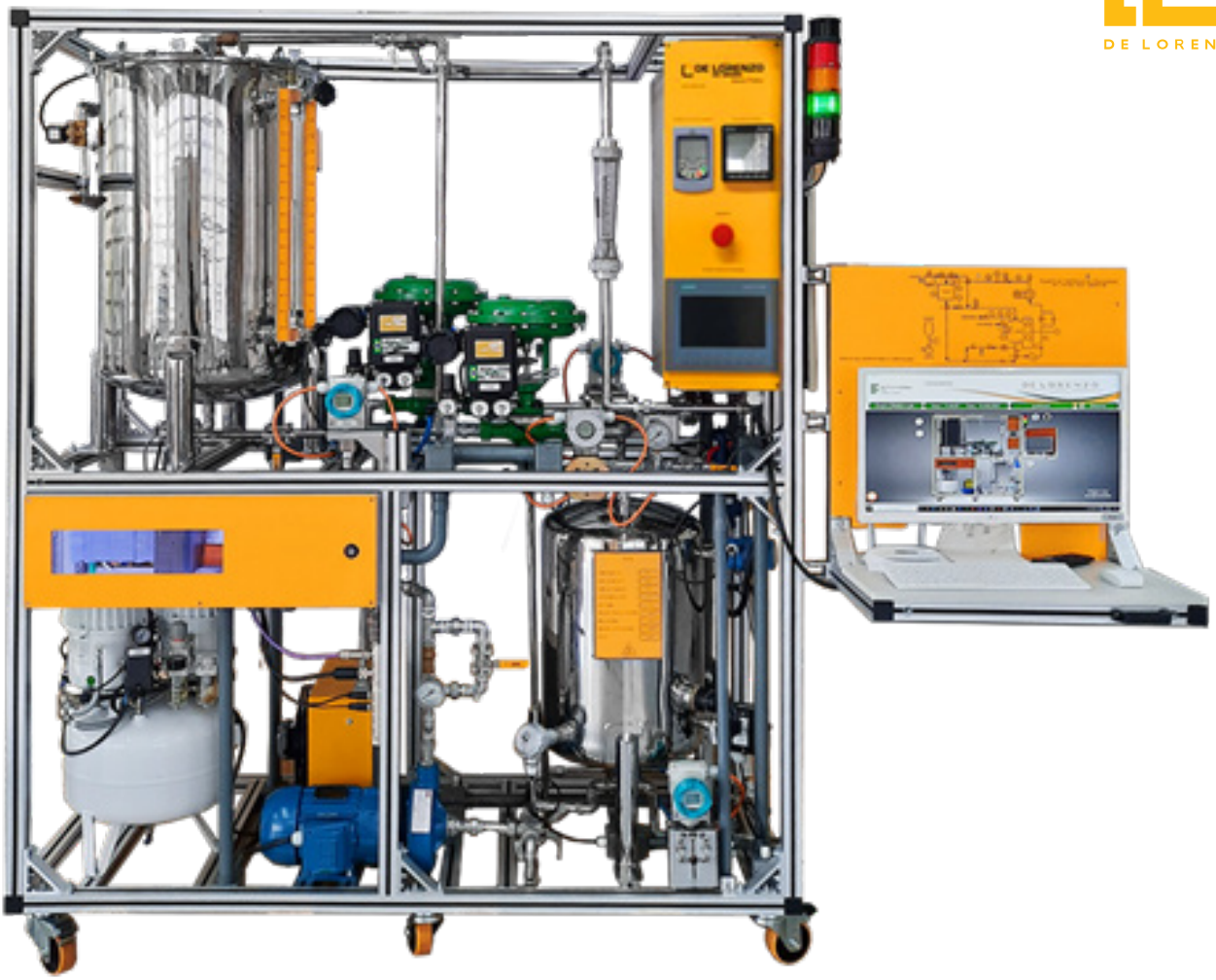
Digitalization in the industry

Digitalization is spreading in many areas, bringing new value in terms of efficiency, competitiveness, sustainability and showing ample room for growth. In terms of digital innovation in the industry, new digital technologies (Artificial Intelligence, Robotics, Internet of Things, Cloud, etc.) have brought great advances in the automation of production processes.
In the so-called "intelligent manufacturing", the presence of autonomous machines equipped with artificial intelligence assigned to the heaviest and most repetitive jobs, the connectivity and dialog between different devices and the centrality of the data, its collection, its analysis, and its use to make decisions, they bring to life a more efficient, safe, and competitive production site.

First, we talk about industrial robotics, one of the technologies most intuitively associated with intelligent manufacturing, and the automation of work, both in the productive sector and for some activities related to administrative work, capable of performing simple tasks such as information and data extraction, transmission and execution.

However, the ability of machines to communicate with each other by exchanging information through Internet of Things (IoT) technology and advanced sensors, with applications related to the monitoring of production flows, quality control and predictive maintenance of machinery is paramount.





Artificial intelligence techniques are also innovative, supporting numerous processes and multiple operations at companies.

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The large amount of data collected by sensors of the machinery, as well as those generated by other devices present on the production site, must be analysed to extract values and make decisions accordingly, for example, in areas such as product development, marketing actions, the whole management area (logistics, customers and process optimization) and forecasting activities such as predictive maintenance and failure prediction. In this case, Big Data technology is key.
When it comes to the cloud, the entire manufacturing industry has learned how to use it to improve the efficiency of the entire production cycle. The ability to use cloud computing and storage services simplifies the digital processes of all companies.

Finally, other technologies also contribute to supporting intelligent manufacturing, including those based on 5G, additive manufacturing and 3D printing, virtual and augmented reality.

DIDACTIC EXPERIENCE

The laboratory has been designed to reconstruct internally, through devices, equipment and systems, hardware and software, the reality in which these new professions are being developed, in order to create real experiences on equipment, instruments and processes, as if the students were operating in a real-life job.
The laboratory aims to develop courses and skills in many technological areas.

ASSOCIATED COURSES

1. **Robotics and automation**
2. **Artificial Intelligence**
3. **Cloud computing**
4. **Cybersecurity**
5. **Internet of Things**
6. **Smart Greenhouse**
7. **Manufacture, modelling, and 3D printing**
8. **Virtual and augmented reality**
9. **Big data**
10. **Blockchain**
11. **E-commerce**
12. **Industry 4.0**

With applications in numerous economic sectors, such as: Agri-food, automotive, ICT, construction, energy, financial services, manufacturing, chemistry and biotechnology, transportation and logistics, green transition, public administration, health, professional services, tourism, and culture..

System feature

The laboratory has a modular structure that allows it to adapt to the different realities and needs of schools.

It consists of a **base module**, which contains the devices and tools to implement the Internet network and all its features, with **workstations for teachers and students,** and **thematic modules**, consisting of devices and / or application software, to achieve the objectives of developing specific competences in different sectors.

WORKSTATIONS

DL NGL-BASE: Teacher Station
Teacher Station
Composed of:

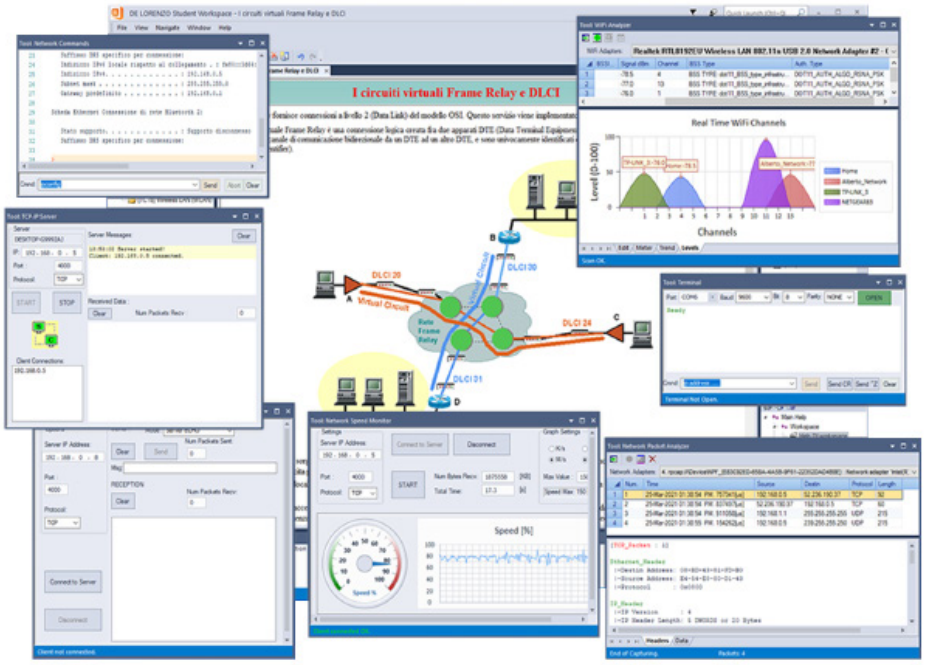
- Base module containing all network devices, with a block diagram illustrating the structure of the entire system, to implement the Internet network in which teachers and students work as if they were operating in real external reality.
- Windows PC with DL Workspace software.

DL NGL-STUDENT: Student station
Composed of:

- Windows PC with DL Workspace software,

Students can work individually or in groups. Student stations are all connected to each other and to the teacher's station via the Internet.
At the hardware device level, 2 student networks have been created to halve the workload, as student stations connect via WiFi, but within the lab, it is possible to create workgroups among students without limitations.
The number of student stations is free. The school can decide how many stations to install in the lab.

DL WORKSPACE

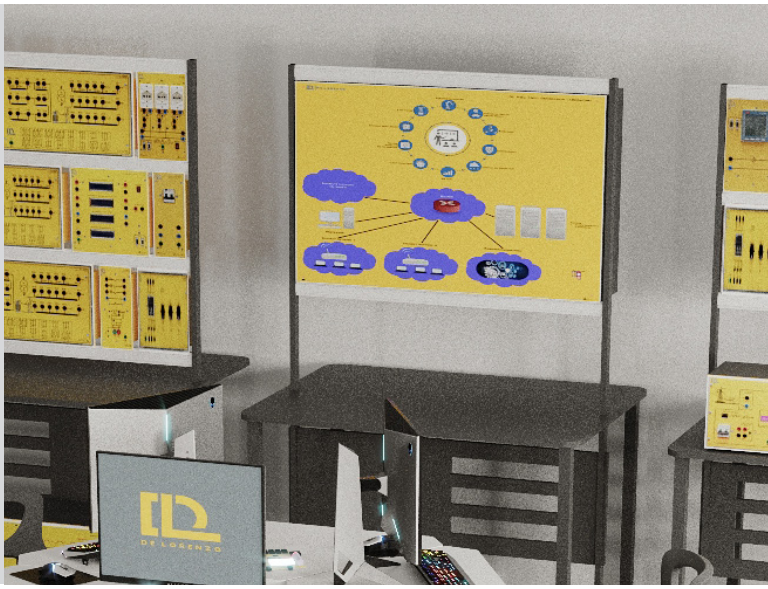


DL WORKSPACE software provides an integrated work environment in which all the tools for study and experimentation are placed, allowing you to:

- access the didactic material in PDF format.
- manage answers to lesson questions.
- perform experiments with Toolbox (Server, Client, Protocol Analyser, Wifi Analyser, etc.).

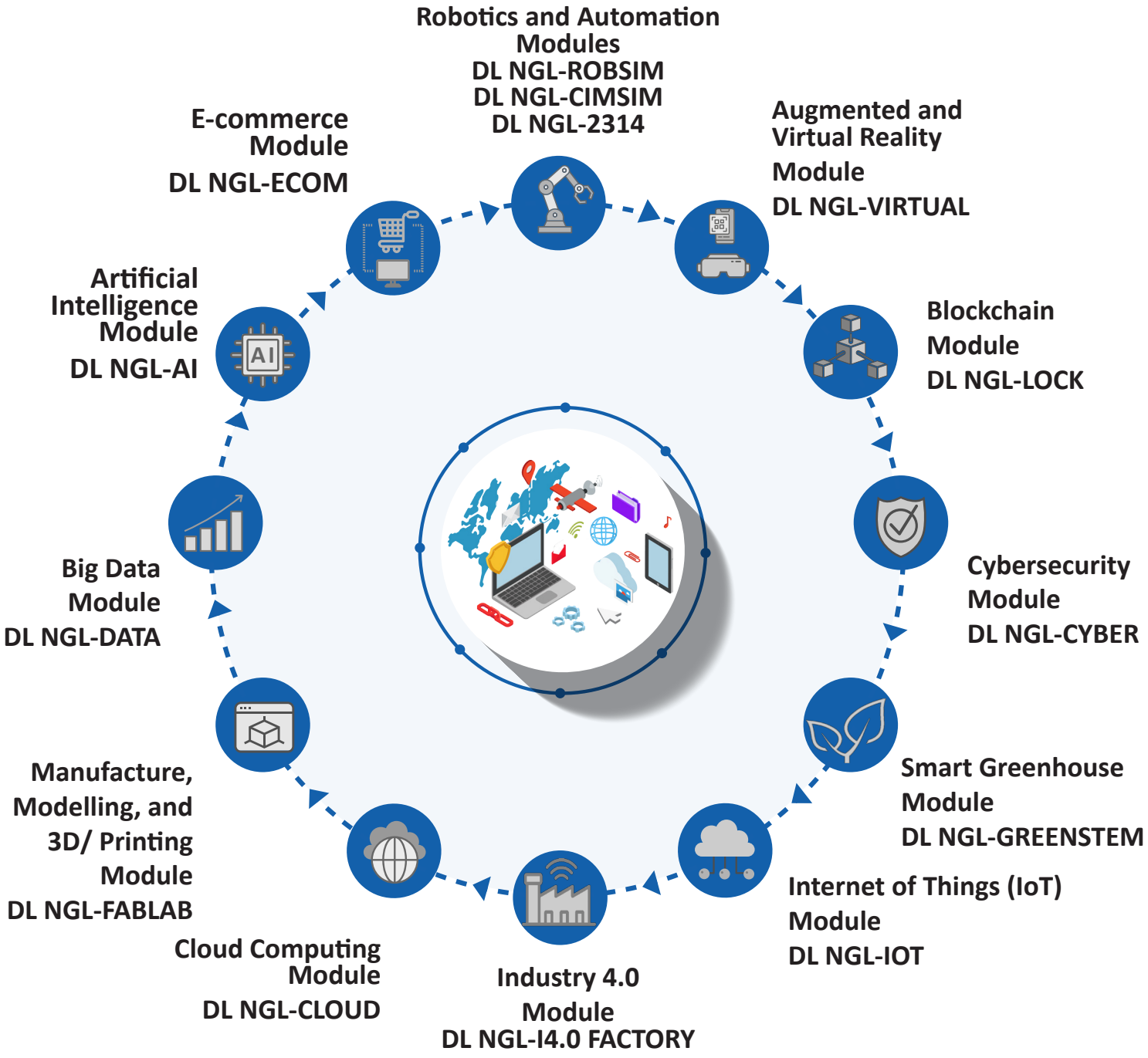
The software is used both by the teacher for teaching and by the students for learning. All student activity is stored in a local database for later reference by the teacher.

Regardless of the application used, it is always possible to carry out preliminary teaching experiences relating to the Internet and its services, such as: OSI model and communication protocols, LAN and WiFi networks, Client-Server model, World Wide Web (HTTP protocol), e-mail (SMTP protocol), file transfer (FTP protocol) and Domain Name System.



THEMATIC MODULES

The modularity of the system allows the thematic modules to coexist with each other within the laboratory without reciprocal limitations, allowing maximum flexibility of use.
While one student (or group) works, for example, on an IoT application, another group can work on the development of e-commerce applications and another on robotics or other applications.



Internet of Things (IoT) Module

DL NGL-IOT

It is used to study all the problems related to the world of the Internet of Things IoT, in which not only people, but also the most common objects can connect to a global network where they can be viewed and controlled by both other objects and network users.
There is no limitation to the type of object that can be connected, thus providing the Internet of Things with an unlimited space of applications: Industry, home automation, medicine, etc.

The module contains devices and tools to configure a complete IoT system where to carry out all exercises and experiments and consists of: Interface card (including a microcontroller, an LCD display, a keyboard and USB interfaces, Ethernet LAN, WiFi, for analog sensors, for digital sensors and actuators), analog sensors (temperature, pressure, force) and digital sensors (brightness, ultrasonic distance, acceleration), actuators (DC motor and stepper motor).

With the module you can study all the problems related to the world of IoT: Characteristics and performance of the devices to connect (sensors, actuators, ...), communication technologies (protocols, networks, ...), information technologies (servers, databases, clients, ...) and performance analysis.

The module also allows the use of MiniSim cards, simulators of real situations that, thanks to the use of an internal microcontroller, allow the student to interact with the simulated system and learn the methods and objectives of the Internet of Things. The description of the simulation cards can be found on the following pages.

Didactic simulators for IoT

The MiniSims are small simulators designed for educational use in the study of Internet of Things (IoT) technology and its applications in various sectors, such as: Agri-food, energy, automotive, manufacturing, etc. computer, health, chemical and biotechnological.

They simulate, through an internal microcontroller, the operation of a computer, a plant, a system, etc., interacting with the student and generating all the information for the connection to the IoT, thus allowing to achieve one of the main objectives of this technology, what is to be seen or controlled by both other objects and network users.
A real IoT system is composed of objects (equipment, plants, systems, etc.), communication networks, servers and clients. An important feature of the MiniSims is to reproduce the entire IoT system on a single workstation, in an 'open' way, where the student can interact autonomously with the different parts of the system.

To use the MiniSims you need the IoT module, in particular, the DevIoT unit for the physical connection of the simulator to the cloud and the DL Workspace application that contains the servers and clients for the full operation of the system.
Experiments can be performed on a single computer, using all the tools of the DL Workspace software

The simulators are connected to the DevIoT unit that sends the information from the simulators to a cloud server. All cloud components are present on the PC.
A LAN connection is used between the DevIoT unit and the PC, in which the MQTT server of the DL Workspace is activated, which receives all the information from the simulators and saves it in a database.
The DL Workspace HTTP server is then used to provide database information to a "remote" user via a web in-terface. On a PC (or on any mobile device) simply using a browser and opening the HTTP server web page with real-time updated information about the state of the simulated plants.

The simulators available are as follows:

- DL MiniSim-ENE1: Domestic photovoltaic system with remote monitoring of operating parameters.
- DL MiniSim-CAR1: Connected car, remote monitoring and diagnosis.
- DL MiniSim-MAN1: Simulation and control of an intelligent factory.
- DL MiniSim-BIO1: Telemedicine, electrocardiogram with remote viewing.
- DL MiniSim-AGR1: Agri-food 4.0 in greenhouses.
- DL MiniSim-CHI1: Chemistry 4.0, remote monitoring of a chemical plant.

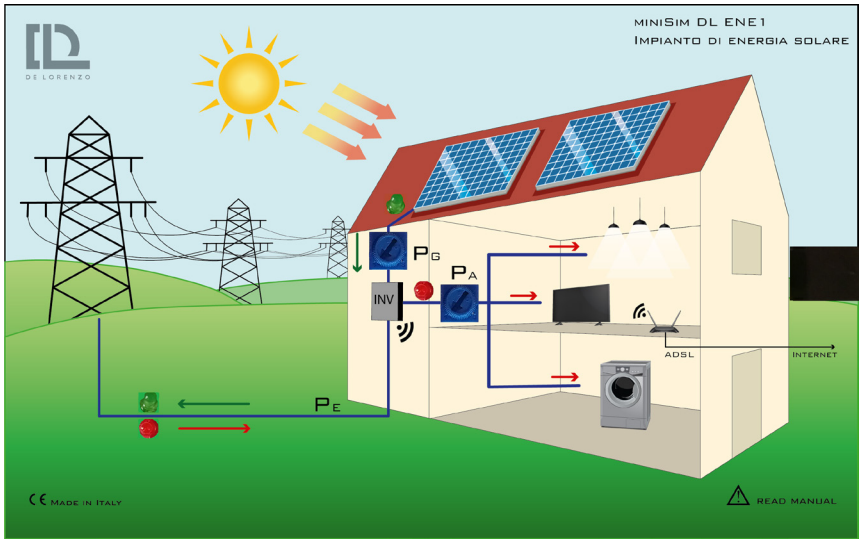
DL MiniSim-ENE1
Home photovoltaic system with remote monitoring of operating parameters

Electric power production systems using photovoltaic panels are increasingly used in the home.

Currently, most of them allow to monitor the system remotely using a PC or a mobile phone using IoT techniques.

The control unit present in the house that uses a domestic connection to the internet sends the production and consumption data via the IoT protocol to a server installed anywhere in the world.

From anywhere else in the world, you can connect to this server and view the data using a simple web interface and HTTP protocol.



The simulator of the DL MiniSim-ENE1 solar system is used, which shows a screen print of the components of the domestic system, and allows to vary, through the potentiometer, the energy produced by the solar panels (to simulate different environmental conditions) and the energy absorbed by the domestic charges. The power absorbed or sent to the network operator is calculated with a subtraction.

DL MiniSim-CAR1
Connected Car, remote monitoring and diagnosis

The connected car is a concept that until a few years ago was considered science fiction and has now become a reality. It is the foundation of many applications, including autonomous driving.
The first applications originated in Formula 1, where it was important to know the condition of the vehicle on the track. Then, with the advancement of technology, particularly that of the Internet of Things (IoT), they expanded to many other sectors.
In this simulator two important applications are proposed, one for remote monitoring of the vehicle to know its health, safety, etc., and another for remote diagnostic operations in real time.
The simulator shows a real system in which a car is constantly connected to the internet and therefore the information from it is available, anywhere, for the monitoring and diagnostic operations mentioned above.

Use the DL MiniSim-CAR1 that contains:

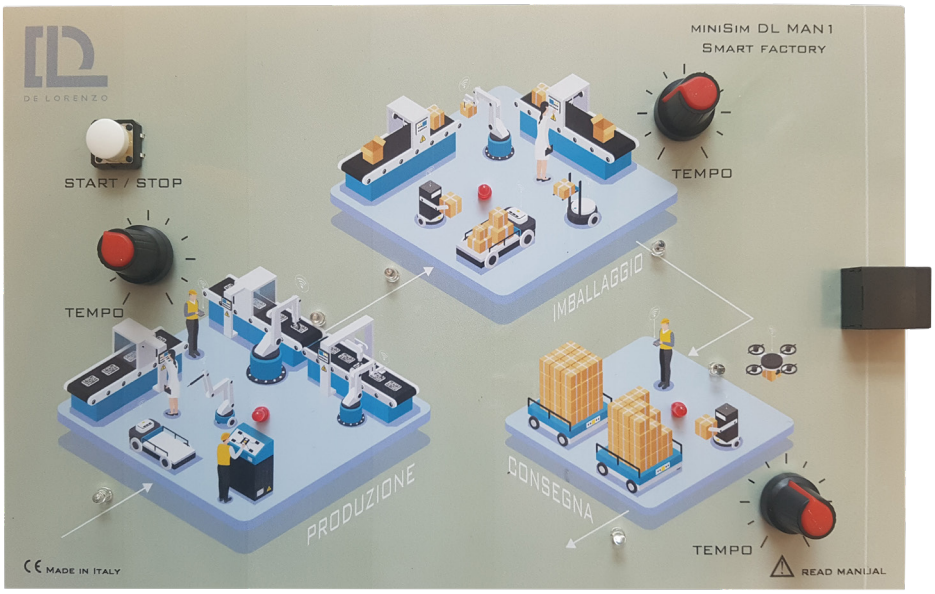
- The scheme of the connected car,
- A car start/stop switch
- A potentiometer to vary the number of engine revolutions.
- Software that calculates the machine's operating parameters in real time.
- A switch for inserting faults in the car.

The DL Workspace also contains a car dashboard, which displays the actual dashboard remotely, and an OBD scan tool for troubleshooting.

DL MiniSim-MAN1
Simulation and control of a smart factory

The Smart Factory is a definition used to describe the use of different digital technologies in order to manage all operations within a production reality.
One of the most suitable technologies to use in an intelligent factory is the Internet of Things (IoT), since it allows the exchange of information between different devices, without human intervention, to synchronize the general operation of the system.
The simulator shows a "real" system, in which 3 workstations cascade together to make a product. Station 1 represents the reception of semi-finished products, Station 2 represents the processing of the product, and Station 3 represents the packaging of the finished product.

In a traditional factory, the system would be governed by a control station (Master) that controls the three workstations (Slaves) and thus coordinates their operation.
In an intelligent factory that uses Internet of Things techniques, the 3 workstations are objects (things) that communicate their status to a server and receive information from the server relative to the status of the other stations, that is, they exchange the status between them.
Station 1 will inform when it is free to accept incoming materials, Station 2 will indicate that production is working, and Station 3 will give the availability of the outgoing product. In this way, each station is able to operate in coordination with the others without the need for superior control logic.



The DL MiniSim-MAN1 is used, which shows a screen print of the components of the complete system and shows the status of the different workstations through multi-colored LEDs.

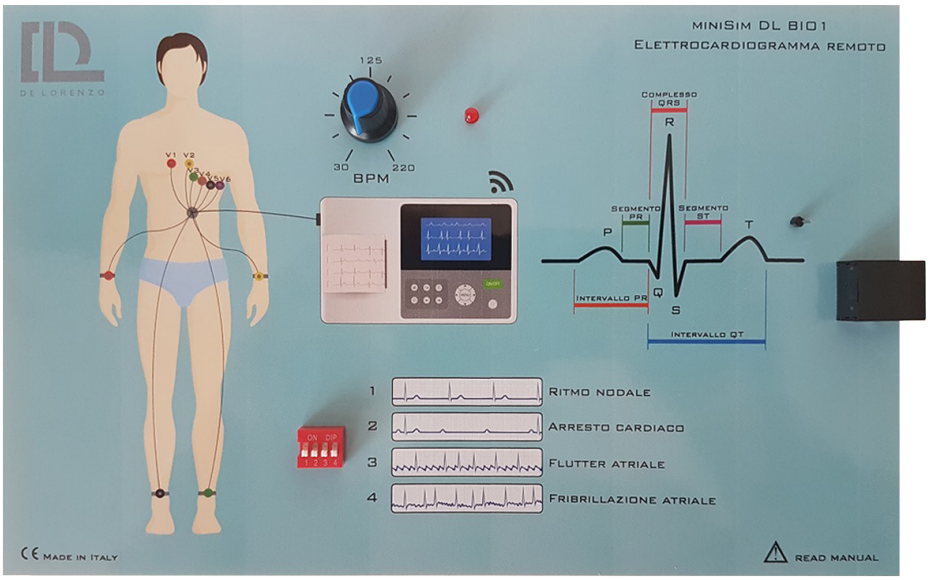
DL MiniSim-BIO1
Telemedicine, Electrocardiogram with Remote Display

Telemedicine is defined as a way of providing health services using innovative technologies, in particular Information and Communication Technologies (ICT), in situations where the healthcare professional and the patient (or two professionals) are not in the same place. Telemedicine involves the secure transmission of medical information and data in the form of texts, sounds, images or other forms necessary for the prevention, diagnosis, treatment and subsequent follow-up of patients.

Telemedicine services can be used with any diagnostic or therapy health service.
However, the provision of telemedicine does not replace the traditional provision of health care in the doctor-patient relationship, but complements it to potentially improve effectiveness, efficiency and adequacy.

The simulator shows a 'real' system in which a patient performs an electrocardiogram, and the doctor controls it in real time remotely.
On the DL MiniSim-BIO1, the ECG signal is generated continuously. A potentiometer allows you to vary the rate from 30 to 220 beats per minute.

It is possible to generate different types of ECGs (the waveform is generated by the microcontroller within the panel) and a dip switch on the panel allows you to select different ECGs with different pathologies.

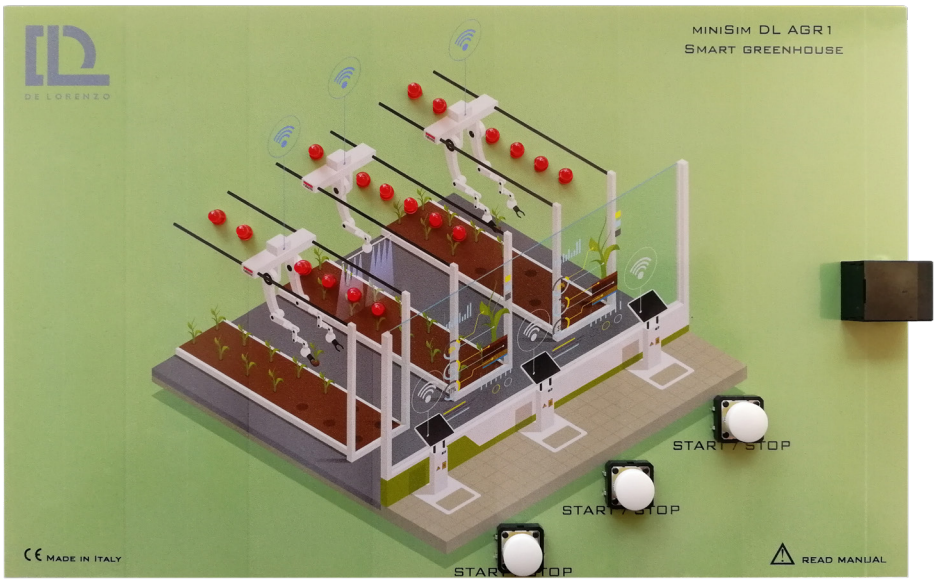


The DL MiniSim-BIO1 is used, which displays a screen print of the entire system components and generates a simulated voltage ECG signal.

DL MiniSim-AGR1
Food Agriculture 4.0 in greenhouses

Food agriculture 4.0 aims to integrate digital technologies and agricultural production to achieve a reduction in energy consumption and resources used in the greenhouse and in the field.
Information technology, which allows remote monitoring of the environment and plants, can ensure favorable environmental conditions for the crop, leading to the objective of increasing the productivity and health of crops, also reducing the use of agrochemicals. In particular, Internet of Things (IoT) technologies together with new intelligent algorithms allow monitoring plant health remotely and coordinating phytosanitary and greenhouse energy management in an integrated manner, in order to optimize crop health and energy consumption.

The information derived from environmental, energy and agricultural monitoring exploits the transmission on the Internet, to be processed remotely from any point thanks to the development of new intelligent algorithms in order to visualize and implement control strategies.
The simulator shows a "real" 4.0 greenhouse system, with an automatic irrigation system, sensors to monitor the weather conditions and actuators to adjust the conditions themselves.



The DL MiniSim-AGR1 which shows a screen print of the components of the complete system, also contains:

- A LED bar showing the position of the irrigation cart.
- A cart start/stop switch.
- The following DevIoT unit resources are also used:
- The actual temperature sensor with PT100 probe.
- The real DC motor for a simple remote temperature control.

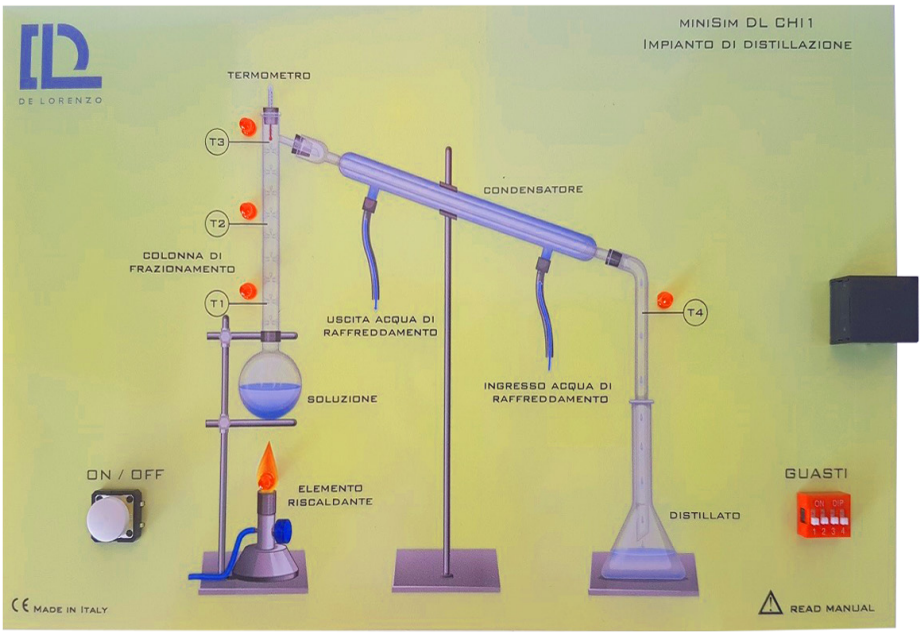
It is possible to observe in real time the position of the irrigation cart and the temperature value and start or stop the irrigation cart and the fan motor.

DL MiniSim-CHI1
Chemistry 4.0, remote monitoring of a chemical plant

While Chemistry 1.0 can be identified as that of coal, Chemistry 2.0 as petrochemistry, Chemistry 3.0 as that of globalization and specialization, Chemistry 4.0 means above all circular economy and digitalization (new paradigms of material production and recovery are used to maximize the use of existing molecules.)

Internet of Things (IoT) technologies are also located in Chemistry 4.0 as tools for the digital collection of all plant data, for real-time monitoring operations, for operations to verify their health status and early detection of possible breakages, and for operations to verify their health for the optimization of production and the reduction of raw material consumption.

The simulator shows a 'real' Industrial Distillation Chemical Plant, in its various components that make it controllable and manageable remotely through IoT technologies.



The DL MiniSim-CHI1 which shows a screen print of the distillation system in all its components, also contains a microcontroller inside which allows the simulation of the operation of the plant.
During the simulation, all the values of the main physical magnitudes that characterize the system are calculated in real time.

Cyber security Module

DL NGL-CYBER

It is used to study the issues related to device, network, and system security, and addresses the various issues from a comprehensive analysis of the OSI model, providing the students with a holistic view of security that can then be applied to the different areas in which they will operate. The OSI model, in fact, is an essential tool not only to understand how a network works, but also to understand where cyber threats arise and what measures to take to eliminate them.

The module consists of a series of software tools, integrated in the DL Workspace, which allow the study and experimentation at different levels of the OSI model in security issues.

The educational program includes the study of the following topics: OSI model and security issues, security in the physical layer, security in the data link layer (ARP spoofing, VLAN), security in the network layer (VPN), security in the transport layer (firewall), session security (encryption and authentication) and presentation and application security (antivirus).

Cloud Computing Module

DL NGL-CLOUD

It contains devices and tools to analyse and experiment at a didactic level this technology that is experiencing an exponential growth at an industrial level and that allows to use, through a remote server and the Internet, software, and hardware resources (such as massive memories for data storage) paying for the service and avoiding the investment related to their purchase.
The module allows to set up and use a private cloud computing system within the lab.

It consists of a server equipped with all the necessary software applications:

- Personal computer
- Ubuntu operating system
- CloudStack Computing platform on the Cloud
- MySQL database

All workstations in the lab can access this server to take advantage of its services and resources, using their own operating system in virtualization mode.
The module allows to study the principles of Cloud Computing, of the IaaS, PaaS, SaaS and XaaS types, distribution models, Cloud services, storage, security and analytics services and database services.

E-commerce Module

DL NGL-ECOM

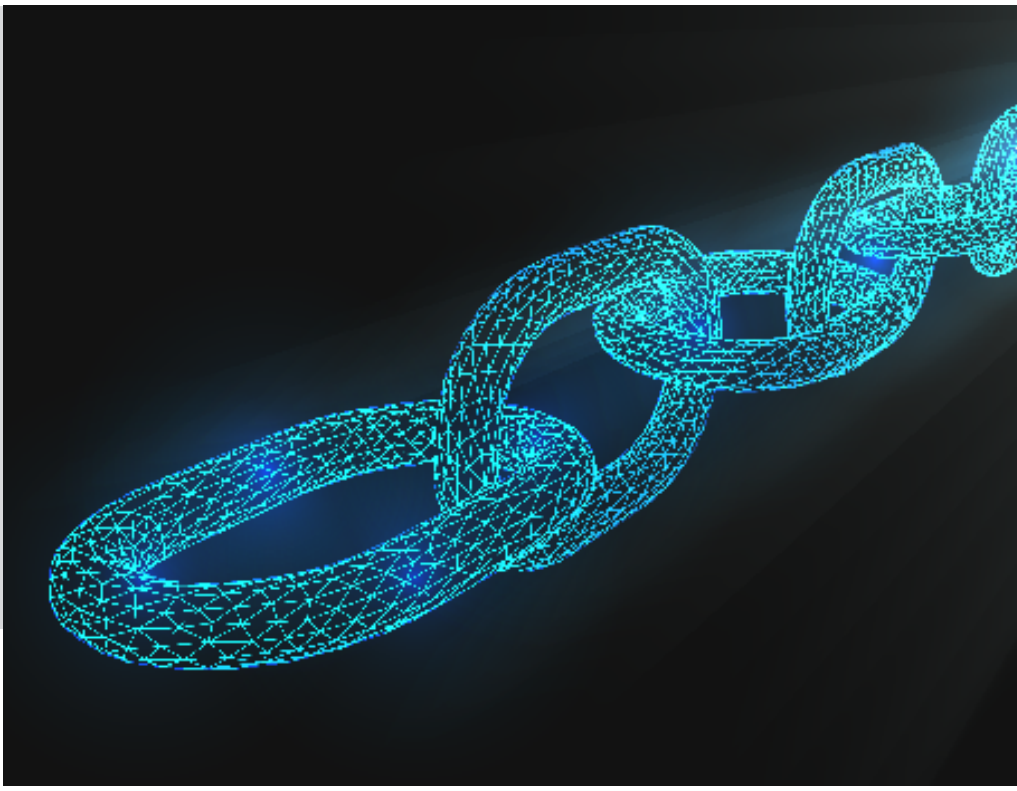
It deals with the problems of e-commerce at a didactic level, that is, the activities of selling and buying products on the Internet.
It allows to configure and use a complete electronic commerce system within the laboratory where, from each job, it is possible to build websites and manage commercial transactions related to the purchase and sale of products and services.
Each workstation can also operate in system user mode for operation verification.

- It consists of a server equipped with all the necessary software applications:
- Personal computer
- Ubuntu operating system
- Apache Web Server
- MySQL database
- WordPress
- E-commerce platform

It allows the study of B2B and B2C e-commerce, Content Management Systems (CMS) to create websites, the creation of e-commerce-oriented websites, database management, product pages, price lists and digital storefronts, electronic payments, and shipping management.

Blockchain Module

DL NGL-BLOCK



It contains the tools to analyse at a didactic level the technologies of Distributed Ledger in general and the blockchain in particular.
Blockchain technology exploits the characteristics of a computer network of nodes for the distributed management of a record containing data and information, uniquely and securely, using a shared mode that does not require a central control and verification entity.
The applications in which this technology can be used are those that do not require mediation and/or centralization entities. Bitcoin virtual currency is an example of blockchain application.

The module is equipped with its own Blockchain Platform, specially developed to analyse this type of applications at a didactic level.

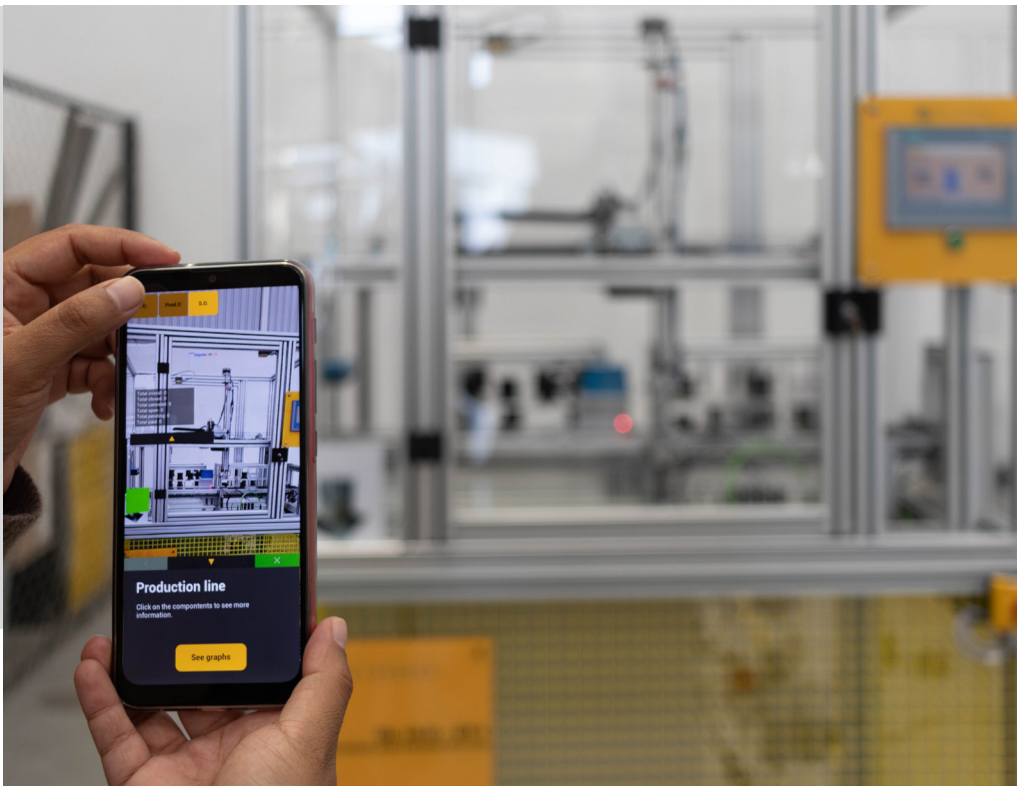
Supports:

- A peer-to-peer network for information exchange
- A distributed ledger
- An authorized network (authorized blockchain)
- Traceability of transfers
- Encryption of transactions
- The immutability of the records and transparency and verifiability.

It allows to study the technologies of Distributed Ledger, characteristics of decentralization, disintermediation, traceability, transparency and immutability of the registry, blockchain with and without authorizations and cryptocurrencies (Bitcoin).

Virtual and Augmented Reality Module

DL NGL-VIRTUAL



It contains the devices and tools for the study and learning of all the issues related to these new technologies of the computer world, particularly interesting in their educational applications.
Virtual reality (VR) aims at active participation, taking the user from the material to an abstract but very real dimension.
Augmented Reality (AR) allows to amplify some perceptions of reality using technological devices, giving the possibility to those who use it to live experiences and nuances of reality that otherwise would not be possible to know.

The module consists of:

- Windows PC with high performance graphics card.
- Software for the creation of applications in virtual and augmented reality: Games, environments, and simulations.
- VR visor kit used to run applications and enter virtual reality: Portable viewfinder surrounding the user's field of view, controller for interaction with virtual reality, power supply.

Big data Module

DL NGL-DATA

The module addresses the study of processing and analysis of large amounts of data in the field of Data Science.
Data Science is a fairly recent science that allows to manage large amounts of data, overcoming the limitations of traditional databases, and allows its processing without the need for programming language skills.

It provides easy-to-use GUI (Graphical User Interface) tools that allow anyone with minimal specific knowledge to store, manipulate and model data.
The module consists of a Data Science platform that can be used on all workstations in the laboratory, allowing:

- Real-time data processing
- Treatment of historical data
- Programming in Python, Java, and R
- Graphical data analysis
- Machine learning

The module involves using Apache Spark, a unified analytics engine for large-scale data processing with built-in modules for SQL, data flows, machine learning, and graph processing, which also allows to use streaming data that could, for example, come from IoT sensors.

Artificial Intelligence Module

DL NGL-AI

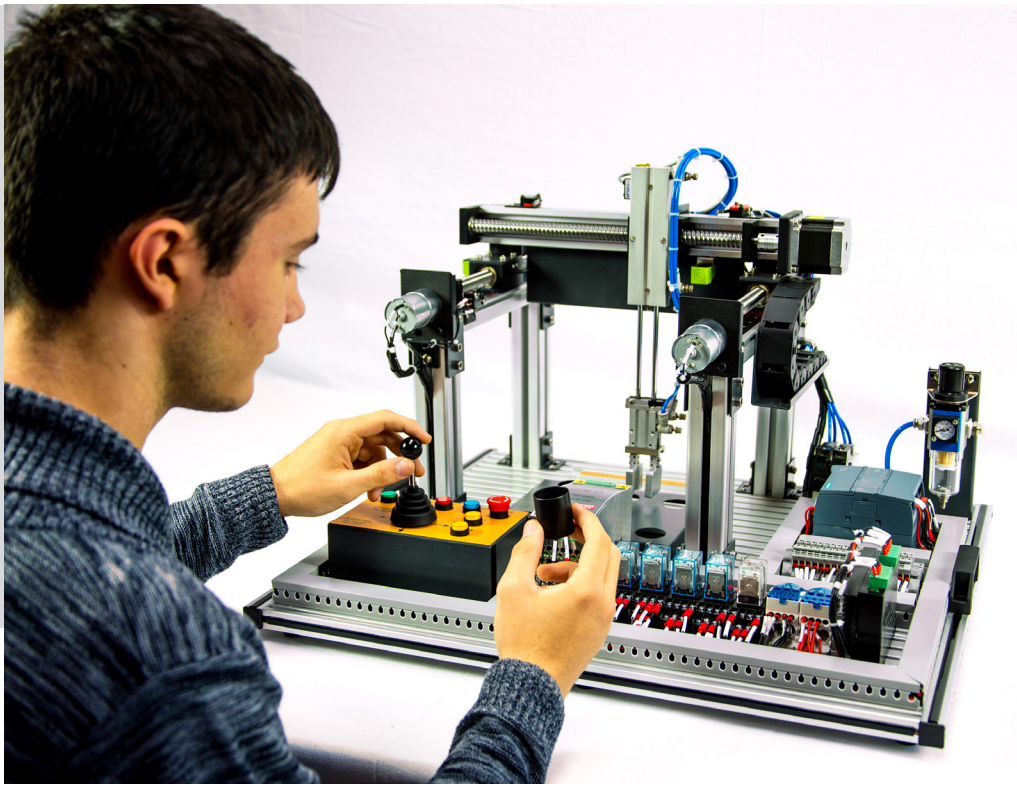
It contains software that has been developed to teach artificial intelligence clearly and effectively. With this software, students can enhance their individual experience in the practical study of artificial intelligence.

Teachers can offer students experiments on the following topics:

- Optimization: Use the genetic algorithm to solve the optimization of problems, such as time or cost problems.
- Classification: Use of neural networks to solve classification problems.
- Reinforcement Learning: Use reinforcement learning to train a robot to reach a specific location.
- Regression: Comparison of decision tree performance and neural network algorithms in system modelling and predictions.

The software includes simulations of 3D industrial environments and includes integrated designs with activities, instructions, content, and automatic validation.
All projects have well-defined objectives and requirements. They are structured into activities and each activity has specific requirements and provides students with instructions, content, and guidance.
The software itself verifies the student's solution for each task in real time and allows them to move on to the next activity.

Robotics and Automation Modules.



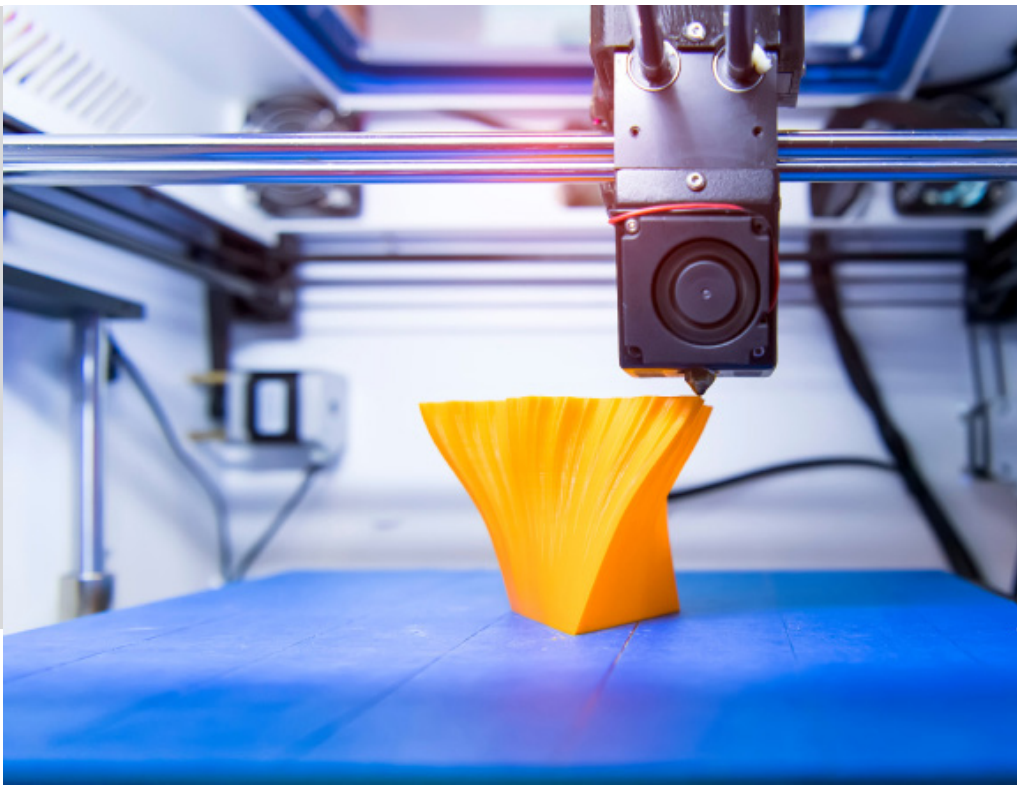
It contains devices and tools for the study and learning of topics related to the robotics and automation sectors, solutions that are at the centre of industry 4.0 thanks to the remarkable development that has taken place in recent years in the field of software and hardware.
The applications of industrial robots are in fact countless. In particular, industrial automation is found in the automotive, aerospace, food, biotechnology, chemical, electronic, medical, nautical and other sectors.
The proposed module consists of a series of didactic hardware systems, each equipped with an electronic interface board, and can be connected to any workstation through the Cloud.

The teaching systems available for this application include:

- DL NGL-ROBSIX and DL NGL-CIM-SIM robotic demonstrators, complete with sensors and actuators representative of the mobility and handling properties characteristic of industrial robots. They allow the development of comprehensive courses on robotic control systems and are equipped with SCADA software for the study of automation and concepts of Industry 4.0.
- DL NGL-2314 Systems for the study of industrial process control that effectively guarantee the safety of the plant and operators, maximize productivity, and minimize waste.

With the modules it is possible to study the problems related to the world of robotics and industrial automation: Characteristics and performance of the devices to be connected (sensors, actuators), communication technologies between devices, control techniques and methodologies, performance analysis and safety of systems.

3D Manufacturing, modelling, and printing module DL NGL-FABLAB



3D printing is one of the latest revolutionary technologies, completely changing the way we can learn, research and prototype, creating something physical out of nothing.

This module consists of a comprehensive course on the most important topics for 3D printing, offering a detailed description of the 4 fundamental steps:

- Planning
- Modelling
- 3D Printing
- Applications.

The course is developed to teach the basic concepts of 3D modelling, mechanics, and model resistance, and you will master the preparation of print files to create indispensable objects in areas such as prototyping, architecture, automotive and all those fields of application that previously required the collaboration of multiple partners.

The module consists of a 3D printer and design and printing software that makes 3D modelling accessible to everyone, with a complete and easy-to-use toolset.

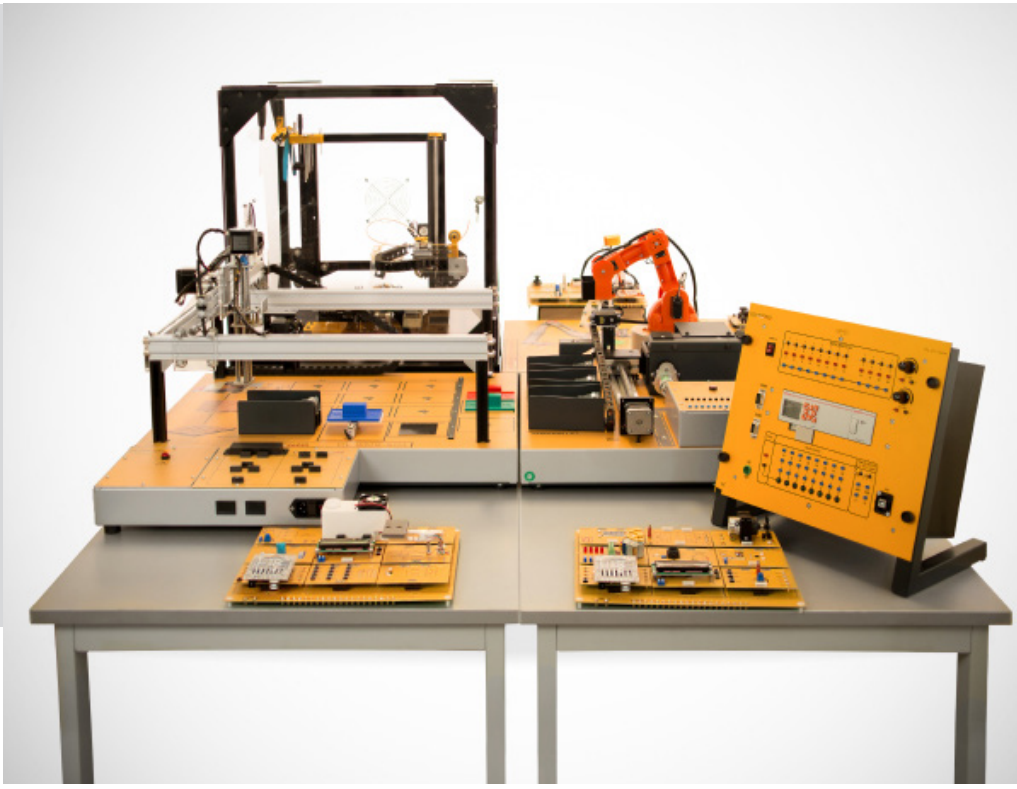
Smart Greenhouse Module

DL NGL-GREEN-STEM

Perfect for a first approach to botany, where young people can create their own cultures in an environment with a rich educational content.
It consists of 2 zones, where for each of them it is possible to monitor humidity, temperature and lighting. The sensors in the greenhouse are connected to a dedicated Arduino board, which takes care of data acquisition and communication.
Through a dedicated software, it is possible to communicate with the Arduino board to acquire and analyse data directly from the PC.
Communication with the system can also be done remotely via a Wi-Fi connection.
It allows checking the optimal ambient humidity and temperature values based on the type of crop as well as the optimal pH values in the soil.
It is provided with ventilation and heating, to regulate the parameters based on environmental conditions, drip and sprinkler irrigation, containers for substrate or soil, a water pump and a set of sensors for temperature, humidity, flow, light and pH.

Industry 4.0 Module

DL NGL-I4.0 FACTORY



The digitization of information, combined with high-performance hardware, allows the implementation of more flexible and optimized production architectures. The level of innovation is such that, today, Industry 4.0 is synonymous with smart manufacturing.
The DL NGL-I4.0 FACTORY is composed of a set of electronic boards and simulators to create a small smart factory.

Using an Arduino open-source microcontroller connected to a SCADA supervisory software for data acquisition and system control, students are able to perform practices covering topics from introductory automation and robotics to protocols of communication, to sensors and actuators up to a complete study of a production process.

The simulators provided with this application are the following:

- **DL NGL-ROBSIM** (for the study of a robotic arm),
- **DL NGL-CIMSIM** (for the study of a conveyor belt),
- **DL NGL-WMS-SIM** (for the study of a smart warehouse).

The integration of the entire factory with its stations is performed through a **SCADA** system for monitoring, handling, and control of the entire production process with the aid of the **DL WORKSPACE** software.

DL NGL NEXT GENERATION LABS

Laboratory for the digital professions of the future

DL NGL LAB

DL NGL-BASE
-Basic Panel
-Teacher's computer (i5 - 8 GB RAM - 256 SSD) including keyboard, mouse, 27-inch monitor and DL WORKSPACE software

DL NGL-STUDENT
-Student computer (i5 - 8 GB RAM - 256 SSD) including keyboard, mouse, 27-inch monitor and DL WORKSPACE software
It should be multiplied by the number of student workstations required in the lab.

IOT Module
DL NGL-IOT
-DevIoT sensor and actuator unit
-Software and instruction manual
It must be multiplied by the number of workstations required. It is installed on the student workstations (DLNGL-STUDENT).

Cybersecurity Module
DL NGL-CYBER
- Software and didactic manual. It requires the DL NGL-IOT module to operate. It is installed on all student workstations (DL NGL-STUDENT) with the DL NGL-IOT module installed.

Cloud Computing Module
DL NGL-CLOUD
-Dedicated server
-Software and didactic manual
By purchasing 1 DL NGL-CLOUD module, the software can be installed on all student workstations (DL NGL-STUDENT).

DL NGL-ECOM
-Dedicated server
-Software and didactic manual
-By purchasing 1 DL NGL-ECOM module, the software can be installed on all student workstations (DL NGL-STUDENT).

DL NGL-BLOCK
- Software and didactic manual
By purchasing 1 DL NGL-BLOCKCHAIN module, the software can be installed on all student workstations (DL NGL-STUDENT).

DL NGL-DATA
-Software and didactic manual
By purchasing 1 DL NGL-DATA module, the software can be installed on all student workstations (DL NGL-STUDENT).

Artificial Intelligence
DL NGL-AI
-Software and didactic manual
By purchasing 1 artificial intelligence module, the software can be installed on all student workstations (DL NGL-STUDENT).

Robotics Module -
DL NGL-ROBSIM
5-axis robot module with didactic manual.
It must be multiplied by the number of workstations required.

Augmented and Virtual Reality
DL NGL-VIRTUAL
-Workstation with dedicated graphics card, keyboard, mouse, and monitor
-Viewer
Software and didactic manual
It must be multiplied by the number of workstations required.

Robotics Module
DL NGL-CIMSIM
Conveyor belt with didactic manual. It must be multiplied by the number of workstations required.

3D Printing Module
DL NGL-FABLAB
3D printer module with teaching manual and software.
It must be multiplied by the number of workstations required. The software can be installed on all student workstations (DL NGL-STUDENT).

Automation Module
DL NGL-2314
- Process control with didactic manual. It must be multiplied by the number of workstations required.

Module Industry 4.0
DL NGL-I4.0 FACTORY
Electronic boards and simulators to create a small smart factory.
It must be multiplied by the number of workstations required.

Module Smart Greenhouse
DL NGL-GREENSTEM
Two-zone greenhouse with sensors, software and Wi-Fi connection.
It must be multiplied by the number of workstations required.

MINISIM

Each of the modules listed below requires the DL NGL-IOT module to function properly:

DL MiniSim-AGR1
Agrofood 4.0 in greenhouses.

DL MiniSim-ENE1
Domestic photovoltaic system with remote monitoring of operating parameters.

DL MiniSim-CAR1
Connected car, remote monitoring, and diagnostics.

DL MiniSim-MAN1
Simulation and control of a Smart Factory.

DL MiniSim-BIO1
Telemedicine, electrocardiogram with remote viewing.

DL MiniSim-CHI1
Chemistry 4.0, remote monitoring of a chemical plant.

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